

## COMPRESSED NATURAL GAS (CNG)

CNG vehicles are available that run on CNG alone, or on either gasoline or CNG as a bi-fuel vehicle. CNG vehicles are fueled at one of the many CNG stations in California. or by a system that works with your home's natural gas connection for overnight refueling in your garage. CNG produces fewer smog-forming and global warming emissions, and reduces our dependence on foreign oil since most natural gas consumed in the US is domestically produced. CNG vehicles are, at present, the cleanest combustion-engine vehicles available for sale.



### ETHANOL (E85) FLEX FUEL

Ethanol is an alcohol made primarily from corn. Ethanol vehicles are currently offered as E85 flex-fuel vehicles with a single fueling system that can run on either gasoline or a pre-blend of 85 percent ethanol and 15 percent gasoline (E85). Ethanol has reduced fuel efficiency because it contains approximately 34 percent less energy per volume unit than gasoline; however, it is usually priced lower to compensate for the reduction in efficiency. When E85 fuel is used, these vehicles have fewer global warming emissions and help to reduce our dependence on foreign oil.



### DIESEL

Recent improvements in diesel engine technology allow modern automotive diesels to be guiet, powerful, and nearly as clean as the best available gasoline engines. The introduction of ultra-low sulfur fuel in 2006 opened the door for diesel engine control systems to advance and substantially reduce emissions, using technologies such as particulate filters and catalytic reduction systems. Growing numbers of these "clean diesels" are coming to market, offering improved fuel economy and reduced global warming emissions compared to gasoline vehicles. While diesels still have room to improve when it comes to smog emissions, they are expected to meet more stringent emission standards over the next few years.



### BIODIESEL

Biodiesel is sometimes used as a non-petroleum diesel replacement fuel made from new and used vegetable oils or animal fats that have been chemically reacted with an alcohol. B20 (20 percent biodiesel) is the most common blend in the United States since it avoids many of the performance and material compatibility concerns associated with B100. Auto manufacturers sometimes allow in-warranty use of B5 and higher after fuel analysis and approval. The use of biodiesel reduces global warming emissions and dependence on foreign oil, although, it remains under debate whether there are any reductions in tailpipe emissions.



### GASOLINE

Some gasoline vehicles have advanced emission control systems that utilize various combinations of multiple catalysts, several oxygen sensors, exhaust gas recirculation, and an air pump, resulting in extremely low levels of smog-forming emissions and zero evaporative emissions. These clean gasoline vehicles are able to meet a smog score of 9 (on a scale of 1–10), and come with an added consumer benefit of a 15-year/150,000-mile warranty. The air quality impact of these vehicles is substantial because they are mass produced at affordable prices in models consumers are driving every day.



# VEHICLE GUIDE

Learn about the variety and advancements in vehicle technologies.

To learn more or to find the advanced technology vehicle that fits your life, check out:

www.DRIVECLEAN.ca.gov

California Environmental Protection Agency | AIR RESOURCES BOARD

**INTRODUCTION TO** 

### **ADVANCED TECHNOLOGY VEHICLES**

Advancements in vehicle technology over the past decade have been substantial. Car buyers have more choices now than ever before in the type of vehicle technology or fuel they use. Since motor vehicles cause more than half of the air pollution in California, the environmental impact of a vehicle is an important consideration that directly affects air quality, global warming and energy security.

### **Environmental Performance**

Protect the environment, choose vehicles with **higher scores:** 

**Global Warming Score** 

Smog Score



For flex-fuel vehicles, when using an alternative fuel, scores may improve. See www.DriveClean.ca.gov

Vehicle emissions are a primary contributor to global warming and smog. Scores are determined by the California Air Resources Board based on this vehicle's measured emissions. Please visit California Environmental Protection Agency www.DriveClean.ca.gov for more information.

AIR RESOURCES BOARD

Starting in 2009, car buyers have a new tool displayed on vehicles, the Environmental Performance Label, which allows you to compare the smog score and the global warming score of the vehicles you are considering. You can find out more about the Label, and find the cleanest vehicle options available today at www.DRIVECLEAN.ca.gov.



#### HYDROGEN

Hydrogen can be produced from many domestic feed stocks, such as natural gas and renewable resources like water, using electrolysis. While the most common method of making hydrogen, using natural gas reformation, results in fewer smoa-forming and global warming emissions than making gasoline, California is working to increase the use of renewable production sources. Hydrogen can be used in fuel cell vehicles (FCV) or internal combustion engine (ICE) vehicles designed for hydrogen. Hydrogen FCVs are zero emission and run on compressed hydrogen fed into a fuel cell "stack" that produces electricity to power the vehicle. Hydrogen ICE vehicles are a good transition to fuel cell vehicles and have fewer smog and global warming emissions than their gasoline counterparts.



### BATTERY ELECTRIC

Battery electric vehicles (EVs) run entirely on electricity stored in batteries and are recharged at your home or at one of the many public charging stations in California. Since recharaina can take six hours or more, battery EV owners typically charge at night or at a charging station near their place of work. Use of electricity as a fuel results in zero tailpipe emissions, lower fuel costs, and extremely low global warming emissions. Battery ÉVs are available in various sizes and types, including small to mid-sized "City-EVs" with a driving range of 40 to 80 miles, and full size EVs with a range between 100 and 200 miles.



### HYBRID ELECTRIC

Traditional hybrid electric vehicles run on both an internal combustion engine and a battery powered electric motor, which results in improved fuel economy and reduced emissions. Since the vehicle's electricity is generated onboard and stored in a battery, traditional hybrids are fueled by gasoline alone, and are not rechargeable by plugging in. There are many hybrid makes and models on the market today, ranging from small sedans to SUVs. Some models are exclusively made to be hybrids, while others are familiar makes and models that are offered in hybrid versions as well. Not all hybrids are created equal; so remember to look at the fuel efficiency and smog scores when comparing makes and models.



### PLUG-IN HYBRID ELECTRIC

Plug-in hybrids are similar to traditional hybrids but are also equipped with a larger, more advanced battery that allows the vehicle to be plugged in and recharged in addition to refueling with gasoline. This larger battery allows you to drive on a combination of electric and gasoline fuels. Some plug-in hybrids will offer 10 to 40 miles of all-electric range and will behave very much like battery electric vehicles until the battery is nearly depleted and the engine starts. Plug-in hybrids have reduced smog and global warming emissions and lower fuel costs, while providing the same conveniences in driving range and gasoline fueling capability as traditional hybrid electric vehicles.